

10/10/00

09/09/00

10-12-00

A

PTO/SB/05 (08-00)

Approved for use through 10/31/2002. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Please type a plus sign (+) inside this box → ⊕
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number**UTILITY
PATENT APPLICATION
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

IR3-012

First Inventor

Jere F. Irwin

Title

Apparatus and Method for
Conveying, Guiding, and Locating

Express Mail Label No.

EL465688324

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) in dupl.
(Submit an original and a duplicate for fee processing)
2. ☒ Applicant claims small entity status
See 37 CFR 1.27.
3. ☒ Specification [Total Pages **30**]
(preferred arrangement set forth below) + title page
- Descriptive title of the invention
 - Cross Reference to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to sequence listing, a table, or a computer program listing appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets **4**]
Figs. 1-4
5. Oath or Declaration [Total Pages **1**]
- a. ☐ Newly executed (original or copy)
- b. ☐ Copy from a prior application (37 CFR 1.63 (d))
(for continuation/divisional with Box 17 completed)
- i. ☐ **DELETION OF INVENTOR(S)**
Signed statement attached deleting inventor(s)
named in the prior application, see 37 CFR
1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76

ADDRESS TO:

Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

7. ☐ CD-ROM or CD-R in duplicate, large table or
Computer Program (Appendix)
8. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
- a. ☐ Computer Readable Form (CRF)
- b. Specification Sequence Listing on:
- i. ☐ CD-ROM or CD-R (2 copies); or
- ii. ☐ paper
- c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(b) Statement ☐ Power of
(when there is an assignee) Attorney
11. ☐ English Translation Document (if applicable)
12. ☐ Information Disclosure ☐ Copies of IDS
Statement (IDS)/PTO-1449 Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☐ Other: **Check for \$ 373.00**

17. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior application No. _____ / _____

Prior application information

Examiner _____

Group / Art Unit _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS☒ Customer Number or Bar Code Label

021567

(Insert Customer No. or Attach bar code label here)

or ☐ Correspondence address below

Name

Address

City

State

Zip Code

Country

Telephone

Fax

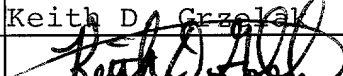
Name (Print/Type)

Keith D. Grzelak

Registration No. (Attorney/Agent)

37,144

Signature



Date 10/10/00

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**FEE TRANSMITTAL
for FY 2000**

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT (\$)**373.00****Complete if Known**

| | |
|----------------------|------------------|
| Application Number | |
| Filing Date | October 10, 2000 |
| First Named Inventor | Jere F. Irwin |
| Examiner Name | |
| Group Art Unit | |
| Attorney Docket No. | IR3-012 |

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:
- Deposit Account Number **23-0925**
- Deposit Account Name **Wells, St. John, et al.**

☒ Charge Any Additional Fee Required
Under 37 CFR 1.16 and 1.17☒ Applicant claims small entity status
See 37 CFR 1.272. ☒ **Payment Enclosed:**☒ Check ☐ Credit card ☐ Money Order ☐ Other**FEE CALCULATION****1. BASIC FILING FEE**

| Large Entity Fee Code (\$) | Small Entity Fee Code (\$) | Fee Description | Fee Paid |
|----------------------------|----------------------------|------------------------|----------|
| 101 690 | 201 345 | Utility filing fee | 355 |
| 106 310 | 206 155 | Design filing fee | |
| 107 480 | 207 240 | Plant filing fee | |
| 108 690 | 208 345 | Reissue filing fee | |
| 114 150 | 214 75 | Provisional filing fee | |

SUBTOTAL (1) (\$)**355****2. EXTRA CLAIM FEES**

| Total Claims | Extra Claims | Fee from below | Fee Paid |
|--------------|--------------|----------------|----------|
| 22 | -20** = 2 | 9 | 18 |
| 3 | -3** = 0 | 39 | 0 |
| | | | |

**or number previously paid, if greater, For Reissues, see below

| Large Entity Fee Code (\$) | Small Entity Fee Code (\$) | Fee Description |
|----------------------------|----------------------------|--|
| 103 18 | 203 9 | Claims in excess of 20 |
| 102 78 | 202 39 | Independent claims in excess of 3 |
| 104 260 | 204 130 | Multiple dependent claim, if not paid |
| 109 78 | 209 39 | ** Reissue independent claims over original patent |
| 110 18 | 210 9 | ** Reissue claims in excess of 20 and over original patent |

SUBTOTAL (2) (\$)**18****FEE CALCULATION (continued)****3. ADDITIONAL FEES**

| Large Entity Fee Code (\$) | Small Entity Fee Code (\$) | Fee Description | Fee Paid |
|----------------------------|----------------------------|--|----------|
| 105 130 | 205 65 | Surcharge - late filing fee or oath | |
| 127 50 | 227 25 | Surcharge - late provisional filing fee or cover sheet | |
| 139 130 | 139 130 | Non-English specification | |
| 147 2,520 | 147 2,520 | For filing a request for ex parte reexamination | |
| 112 920* | 112 920* | Requesting publication of SIR prior to Examiner action | |
| 113 1,840* | 113 1,840* | Requesting publication of SIR after Examiner action | |
| 115 110 | 215 55 | Extension for reply within first month | |
| 116 380 | 216 190 | Extension for reply within second month | |
| 117 870 | 217 435 | Extension for reply within third month | |
| 118 1,360 | 218 680 | Extension for reply within fourth month | |
| 128 1,850 | 228 925 | Extension for reply within fifth month | |
| 119 300 | 219 150 | Notice of Appeal | |
| 120 300 | 220 150 | Filing a brief in support of an appeal | |
| 121 260 | 221 130 | Request for oral hearing | |
| 138 1,510 | 138 1,510 | Petition to institute a public use proceeding | |
| 140 110 | 240 55 | Petition to revive - unavoidable | |
| 141 1,210 | 241 605 | Petition to revive - unintentional | |
| 142 1,210 | 242 605 | Utility issue fee (or reissue) | |
| 143 430 | 243 215 | Design issue fee | |
| 144 580 | 244 290 | Plant issue fee | |
| 122 130 | 122 130 | Petitions to the Commissioner | |
| 123 50 | 123 50 | Petitions related to provisional applications | |
| 126 240 | 126 240 | Submission of Information Disclosure Stmt | |
| 581 40 | 581 40 | Recording each patent assignment per property (times number of properties) | |
| 146 690 | 246 345 | Filing a submission after final rejection (37 CFR § 1.129(a)) | |
| 149 690 | 249 345 | For each additional invention to be examined (37 CFR § 1.129(b)) | |
| 179 690 | 279 345 | Request for Continued Examination (RCE) | |
| 169 900 | 169 900 | Request for expedited examination of a design application | |

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$)**SUBMITTED BY**Name (Print/Type) **Keith D. Orzelak**Registration No. (Attorney/Agent) **37,144****Complete (if applicable)**Telephone **509/624-4276**Signature **Keith D. Orzelak**Date **10/10/00****WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

Burden Hour Statement. This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

EL465688324JC925 U.S. PTO
09/686714
10/10/00

| Demographics | | Neurology | | Neurophysiology | | Electroencephalography | | Electromyography | | Immunology | | Genetics | | Pathology | | Therapeutics | | Prognosis | |
|--------------|------|-----------|-----|-----------------|-----|------------------------|-----|------------------|-----|------------|-----|----------|-----|-----------|-----|--------------|-----|-----------|-----|
| Study | Year | Age | Sex | Age | Sex | Age | Sex | Age | Sex | Age | Sex | Age | Sex | Age | Sex | Age | Sex | Age | Sex |
| 1 | 2015 | 25 | M | 25 | M | 25 | M | 25 | M | 25 | M | 25 | M | 25 | M | 25 | M | 25 | M |
| 2 | 2016 | 28 | F | 28 | F | 28 | F | 28 | F | 28 | F | 28 | F | 28 | F | 28 | F | 28 | F |
| 3 | 2017 | 30 | M | 30 | M | 30 | M | 30 | M | 30 | M | 30 | M | 30 | M | 30 | M | 30 | M |
| 4 | 2018 | 32 | F | 32 | F | 32 | F | 32 | F | 32 | F | 32 | F | 32 | F | 32 | F | 32 | F |
| 5 | 2019 | 35 | M | 35 | M | 35 | M | 35 | M | 35 | M | 35 | M | 35 | M | 35 | M | 35 | M |
| 6 | 2020 | 38 | F | 38 | F | 38 | F | 38 | F | 38 | F | 38 | F | 38 | F | 38 | F | 38 | F |
| 7 | 2021 | 40 | M | 40 | M | 40 | M | 40 | M | 40 | M | 40 | M | 40 | M | 40 | M | 40 | M |
| 8 | 2022 | 42 | F | 42 | F | 42 | F | 42 | F | 42 | F | 42 | F | 42 | F | 42 | F | 42 | F |
| 9 | 2023 | 45 | M | 45 | M | 45 | M | 45 | M | 45 | M | 45 | M | 45 | M | 45 | M | 45 | M |
| 10 | 2024 | 48 | F | 48 | F | 48 | F | 48 | F | 48 | F | 48 | F | 48 | F | 48 | F | 48 | F |
| 11 | 2025 | 50 | M | 50 | M | 50 | M | 50 | M | 50 | M | 50 | M | 50 | M | 50 | M | 50 | M |
| 12 | 2026 | 52 | F | 52 | F | 52 | F | 52 | F | 52 | F | 52 | F | 52 | F | 52 | F | 52 | F |
| 13 | 2027 | 55 | M | 55 | M | 55 | M | 55 | M | 55 | M | 55 | M | 55 | M | 55 | M | 55 | M |
| 14 | 2028 | 58 | F | 58 | F | 58 | F | 58 | F | 58 | F | 58 | F | 58 | F | 58 | F | 58 | F |
| 15 | 2029 | 60 | M | 60 | M | 60 | M | 60 | M | 60 | M | 60 | M | 60 | M | 60 | M | 60 | M |
| 16 | 2030 | 62 | F | 62 | F | 62 | F | 62 | F | 62 | F | 62 | F | 62 | F | 62 | F | 62 | F |
| 17 | 2031 | 65 | M | 65 | M | 65 | M | 65 | M | 65 | M | 65 | M | 65 | M | 65 | M | 65 | M |
| 18 | 2032 | 68 | F | 68 | F | 68 | F | 68 | F | 68 | F | 68 | F | 68 | F | 68 | F | 68 | F |
| 19 | 2033 | 70 | M | 70 | M | 70 | M | 70 | M | 70 | M | 70 | M | 70 | M | 70 | M | 70 | M |
| 20 | 2034 | 72 | F | 72 | F | 72 | F | 72 | F | 72 | F | 72 | F | 72 | F | 72 | F | 72 | F |
| 21 | 2035 | 75 | M | 75 | M | 75 | M | 75 | M | 75 | M | 75 | M | 75 | M | 75 | M | 75 | M |
| 22 | 2036 | 78 | F | 78 | F | 78 | F | 78 | F | 78 | F | 78 | F | 78 | F | 78 | F | 78 | F |
| 23 | 2037 | 80 | M | 80 | M | 80 | M | 80 | M | 80 | M | 80 | M | 80 | M | 80 | M | 80 | M |
| 24 | 2038 | 82 | F | 82 | F | 82 | F | 82 | F | 82 | F | 82 | F | 82 | F | 82 | F | 82 | F |
| 25 | 2039 | 85 | M | 85 | M | 85 | M | 85 | M | 85 | M | 85 | M | 85 | M | 85 | M | 85 | M |
| 26 | 2040 | 88 | F | 8 | | | | | | | | | | | | | | | |

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23

1 to a die in step-by-step movement that is mechanically synchronized with
2 the stroke of the punch. The treadle also includes opposed pairs of
3 vertical guide strips between each article. Each guide strip is carried by
4 a spacer that is mounted onto a cross frame member of the treadle.
5 Opposed pairs of guide strips, provided between each adjacent pair of
6 formed articles in the sheet, are spaced apart slightly from each other
7 by a distance slightly greater than the thickness of the sheet passing
8 therebetween. However, such close spacing coupled with the use of
9 guide strips between every adjacent pair of articles results in increased
10 frictional forces which tends to result in mis-feeding and jamming of the
11 treadle, particularly when running the treadle at relatively high product
12 feed rates.

13 14 SUMMARY OF THE INVENTION

15 A treadle device is provided for conveying, guiding, and locating
16 web-supported articles or products during a web processing operation.
17 More particularly, a treadle assembly guides web-supported articles into
18 a trim press prior to and while severing the articles from the web.
19 Such treadle device provides accurate location of articles while moving
20 the web while and reducing frictional forces generated between the
21 treadle and web which otherwise result in an increased occurrence of
22 mis-feeds and misalignment of the web and articles, particularly during
23 relatively high speed trim operations. An additional degree of accuracy

is also provided during such severing operation over that previously provided via use of accurate high speed conveying, guiding, and locating techniques. Additionally, feedback controlled operation is maintained to drive a servo pick and servo helper of a web feed delivery device associated with the treadle and trim press.

According to one aspect, a trim press article handling apparatus includes a frame, a punch, a die, and a treadle. The punch is carried by the frame. The die is carried by the frame and cooperates in relative movement with the punch to sever articles from a web. The treadle is carried for movement relative to the die. The treadle includes a web guide member, a primary guide strip spaced from the guide member slightly greater than a thickness of the web, a secondary guide strip spaced from the guide member at least four thicknesses of the web and spaced apart from the primary guide strip, and an article detector carried by at least one of the primary guide strip and the secondary guide strip. The article detector is operative to detect position of an article in the web by detecting the position of a protuberance in the web as the protuberance is conveyed between the primary guide strip and the secondary guide strip.

According to another aspect, an article conveying, guiding, and locating device includes a treadle, a web conveyor, an article detector, and a controller. The treadle includes a web guide plate, and a guide strip spaced slightly greater than a thickness of the web from the guide

1 plate. The web conveyor has a servo pick assembly and a servo helper
2 assembly driven by a servo motor, and is configured to move a web of
3 articles wherein the servo pick assembly is carried by the treadle. The
4 article detector is carried by the treadle and is operative to detect
5 location of an article in the web during movement of the web. The
6 controller communicates with the drive motors and the article detector
7 and is operative to controllably regulate and synchronize operation of the
8 servo pick assembly and the servo helper assembly in response to
9 detected location of the article.

10 According to yet another aspect, a method is provided for
11 delivering web-supported articles between dies and punches of a trim
12 press, including: providing a treadle having an article detector; while
13 moving the web and articles, guiding the web and articles along the web
14 and between a pair of articles in a row extending transverse to a travel
15 path direction; detecting location of an article in the web using the
16 article detector; in response to detecting the location of the article,
17 controllably moving the web to position the article between a
18 corresponding punch and die of the trim press.

19 20 **BRIEF DESCRIPTION OF THE DRAWINGS**

21 Preferred embodiments of the invention are described below with
22 reference to the following accompanying drawings.
23

to this embodiment, but is intended to cover alternatives, equivalents, and modifications such as are included within the scope of the appended claims.

In an effort to prevent obscuring the invention at hand, only details germane to implementing the invention will be described in great detail, with presently understood peripheral details being incorporated by reference, as needed, as being presently understood in the art.

A preferred embodiment of Applicant's invention is shown on a thermoforming machine trim press having a treadle system that is generally designated with reference numeral 10 in Figure 1. More particularly, treadle system 10 is provided on a trim press 12 to accurately convey, guide, and locate articles 14 formed within a sheet, or web, 16 of thermoformable material during an article trim operation that severs articles 14 from web 16. Treadle system 10 is operative to intermittently convey and align articles 14 so as to successively sever rows of such articles 14 from the web 16.

A control system 18 of treadle system 10 choreographs operation of trim press 10 acting in unison with a servo motor driven conveyor 20 that includes a servo pick assembly 60 and a servo helper assembly 62. Conveyor 20 moves web 16 in which individual articles, or products, 14 have previously been formed using a thermoforming machine (not shown). In operation, web 14 is driven in intermittent motion using control system 18 and conveyor 20 to successively feed individual rows of articles

1 movement by movable platen 26, whereas die plate 32 is fixedly carried
2 by stationary platen 28. However, it is understood that platen 28 and
3 die plate 32 can also be movably supported for operation according to
4 an alternative construction.

5 As shown in Figure 1, movable platen 26 is carried for horizontal
6 reciprocation by crank arm assemblies 34-37. Details of one exemplary
7 thermoforming machine suitable for incorporating treadle 10 and having
8 such crank arm assemblies are shown in U.S. Patent Application Serial
9 No. 08/691,856, now U.S. Patent No. 6,067,886, entitled "Machine Trim
10 Press Having Counterbalance Features", and naming the inventor as
11 Jere F. Irwin. Such U.S. Patent No. 6,067,886 is herein incorporated by
12 reference.

13 An electric servo motor 31 drives crank arm assemblies 34-37 via
14 a transfer case assembly 33 including a pair of connected transfer cases
15 and a respective pair of rotating drive shafts 39, 41 similar to those
16 disclosed in U.S. Patent No. 6,067,886, previously incorporated by
17 reference.

18 Each crank arm assembly 34-37 comprises a throw arm 38 and a
19 platen connecting rod 40, wherein arm 38 and rod 40 cooperate to form
20 a kinematic linkage that drives a dedicated corner of platen 26 for
21 horizontal, guided reciprocation. Additionally, two cylindrical, stationary
22 guide posts (not shown) are rigidly carried by a frame 42 to support
23 platen 26 for movement in an axial, horizontal direction. Optionally,

1 four guide posts can be configured to support platen 26 with two
2 corresponding bronze bushings. The use of platen guide posts is
3 understood in the art. Accordingly, such guide posts have been omitted
4 from the figures in order to simplify the drawing and to prevent
5 obscuring the invention at hand.

6 Additionally, a pair of stationary, cylindrical guide posts 44, 46 are
7 rigidly supported by frame 42 to guide horizontal, reciprocating movement
8 of treadle 10 relative to frame 42 and stationary platen 28. Bronze
9 bushings 48 and 50-51 on treadle 10 are affixed to a frame 52 of
10 treadle 10, and are configured to slide along guide posts 44, 46,
11 respectively.

12 Stationary guide members 54 and 56, in the form of pairs of edge
13 guide tracks and central guide tracks, form a self-feeding canopy 49 that
14 guides web 16 and articles 14. More particularly, guide members 54 and
15 56 guide and move web 16 and articles 14 from a thermoforming
16 machine (not shown), positioned upstream of trim press 12, downwardly
17 into treadle 10 and between punch plate 30 and die plate 32 for
18 severing articles 14 from web 16 therebetween.

19 Web conveyor assembly 20 moves web 16 and articles 14 along
20 guide members 54 and 56 and through treadle 10. Web conveyor 20
21 comprises a servo pick assembly 60 and a servo helper assembly 62.
22 Servo pick assembly 60 is carried by treadle 10, whereas servo helper
23 assembly 62 is carried by guide member 54. Accordingly, servo pick

assembly 60 is carried for movement relative to stationary servo helper assembly 62.

As shown in Figure 1, web conveyor assembly 20 is illustrated in simplified form. More particularly, servo pick assembly 60 and servo helper assembly 62 are each depicted as a drive wheel assembly 64, 66, wherein each includes a servo motor (not shown) that is controllably actuated via a control system 18 to impart intermittent motion that feeds web 16 into trim press 12.

Servo pick assembly 60 and servo helper assembly 62, according to one construction, each include a Siemens servo motor Model Part No. 1FT5062-1AC71-4FA0, commercially available in the United States from Siemens Energy & Automation, of Atlanta, Georgia. Additionally, the servo motors for servo pick assembly 60 and servo helper assembly 62 each further includes a rotary encoder which is used in conjunction with the servo motor as a feedback signal to detect motion of drive wheels 72 and 78 in order to directly measure the amount of feed imparted by server helper assembly 62 relative to the feed of servo pick assembly 60. Accordingly, the servo helper assembly is synchronized in relation to the speed of the servo pick assembly.

According to prior art techniques, a servo pick assembly was utilized with a helper assembly having a variable speed motor. The variable speed motor was regulated so as to deliver a distance of web at least as much as that which is moved by the servo pick assembly.

An accumulation region was provided along guide member 54 to accumulate any excess web which is overfed by the helper assembly, wherein the helper assembly is driven by the variable speed motor which is run at a speed that delivers a web equal to or greater in quantity than that delivered by the servo pick assembly. Hence, the accumulation of web and articles occurs along the guide member. However, the buildup of excess sheet there along has a tendency to bounce the sheet and articles around, which can cause misalignment problems and cause a reduction in the maximum operating speed for the conveyor. Accordingly, synchronization of a servo helper assembly with a servo pick assembly leads to increased product throughput rates. Such result is realized because the motor on the servo helper assembly can duplicate a nearly identical motion as the motor on the servo pick assembly since both motors comprise servo motors.

Additionally, a photo proximity switch 112 is carried by guide member 56, beneath one edge of web 16 for detecting the proximity of web 16 in relation to guide member 56. More particularly, switch 112 comprises a Model No. E51-Q25FN6FF100Q sensor, otherwise referred to as an Easy-Easy-Beam Q25 Series sensor, sold commercially by Banner Engineering Corporation of Minneapolis, Minnesota. Such a photo proximity switch has a focal range that monitors the proximity of web 16. When the web is within a focal point range of approximately four inches, a digital output is generated. When the focal point exceeds the

Accordingly, actuation of drive wheel assembly 64 via controller 68 is operative to intermittently deliver rows of articles 14 into trim press 12. Such rows of articles 14 are then severed as control circuitry 68 of central system 18 actuates a severing operation via trim press 10. Subsequently, a scrap web 74 is delivered from trim press 12 and ground into small pieces using a comminuting device (not shown) configured for grinding up scrap web 74 and positioned beneath trim press 12.

S:\R3\012\001 wpd A270010101533N 14 PAT-US\AP-RED

As shown in Figure 1, drive wheel assembly 64 comprises a dual servo motor driven roller feed assembly referred herein as servo pick assembly 60. According to one construction, follower wheels 70 and 76 are each formed from a high density polyethylene (HDPE) plastic material. Also according to one construction, drive wheels 72 and 78 are each formed from an anodized aluminum material having a knurled radial outer surface that coacts with web 16.

13 Additionally, web 16 is delivered through an oven and a
14 thermoforming machine using a web conveyor, upstream of trim press 12.
15 One exemplary detailed construction for a web conveyor is disclosed in
16 U.S. Patent No. 5,806,745, herein incorporated by reference.

17 According to one construction, article registration is carried out by
18 adjusting the operation of conveyor 20 using controller 18 in order to
19 adjust the advancement and positioning of individual articles between
20 punch plate 30 and die plate 32.

21 However, in some cases, it is very difficult to adjust the set-up
22 and component positioning for a web conveyor in order to accurately and
23 precisely deliver articles 14 between punch plate 30 and die plate 32.

1 apparatus are suitable for grinding up the resulting scrap web are
2 disclosed in U.S. Patents Nos. 4,687,144; 5,836,527; 5,860,607; and
3 5,893,523, each herein incorporated by reference. Scrap web 74 is
4 accordingly forwarded into such a recycling, pulverizing machine where
5 the scrap web is shredded and then later recycled to form a new web
6 of thermoformable plastic material.

7 Details of one exemplary thermoforming machine suitable for
8 forming articles 14 within web 16 are disclosed in U.S. Patent No.
9 5,773,540. U.S. Patent No. 5,773,540 is herein incorporated by reference.

10 Control system 18 of Figure 1 comprises a controller having control
11 circuitry 68 such as processing circuitry and memory. According to one
12 construction, processing circuitry is provided by a central processing unit
13 (CPU). According to another construction, processing circuitry is
14 provided by a microcontroller which cooperates to form the controller.
15 It is understood that memory is operative to store software subroutines
16 that are retrieved and implemented on the processing circuitry in order
17 to impart motion control functionality by way of controller 18 to trim
18 press 12 and conveyor 20.

19 As shown in Figure 1, control system 18 is operative to generate
20 control signals that direct operation of servo drive motor 31 that drives
21 crank arm assemblies 34-37 and thereby imparts reciprocation to movable
22 platen 26. Servo drive motor 31 comprises a highly accurate
23 computerized servo motor and servo drive which can be accurately driven

by control system 18. In operation, servo drive motor 31 drives a gear box or transfer case 33 that imparts a rotary motion to each of crank arm assemblies 34-37. Furthermore, control system 18 is operative to deliver a control signal to the servo drive motors of servo pick assembly 60 and servo helper assembly 62 that advances article conveyor 20. Additionally, control system 18 receives an input signal from an article detector 80 provided on treadle 10 for detecting the location of articles being moved by treadle 10 into trim press 12.

As shown in Figures 1 and 3, treadle 10 is driven via a kinematic linkage 87 by movable platen 26, wherein movable platen 26 is driven via motor 31. Accordingly, kinematic linkage 87 causes frame 52 of treadle 10 to reciprocate back and forth in relation to the movement of movable platen 26, relative to stationary platen 28. Kinematic linkage 87 includes a rocker arm 89 which has a fixed rotatable pivot attached to frame 42.

As shown in Figure 2, a partial view of the treadle illustrates important components relating to Applicant's invention; namely, the frame of treadle 10 includes a pair of side plates 88 (only one illustrated herein) which are joined together by three tie rods 90. A primary guide member 82 is provided in proximate association with web guide plate, or web guide member, 100. A secondary guide member 84 is spaced substantially further apart from plate 100 than is primary guide member 82. Secondary guide member 84 is provided principally to serve as a

gross alignment structure which is received between adjacent rows of articles so as to grossly induce alignment of articles with web guide plate 100 relative to article apertures 102.

Primary guide member 82 and secondary guide member 84 each include an attachment plate 92 having a quick release adjustment collar 92 which includes a threaded, rotatable lock arm that enables clamping and unclamping of adjustment collar 92 along a central one of tire rods 90. In this manner, primary guide member 82 and secondary guide member 84 can be quickly and easily laterally adjusted in position relative to web guide plate 100 so as to accommodate changes to different die configurations.

Primary guide member 82 further comprises a clamp bar 96 affixed with fasteners to attachment plate 94, and further affixed to support a guide strip 98 that is nested in proximate relation relative to a surface of guide plate 100. According to one construction, a gap exists between guide strip 98 and web guide plate 100 somewhere in the range of 1-3.5 thicknesses of a web of material which is to be received and processed therebetween.

Secondary guide member 84 further comprises a clamp bar 96 carried by attachment plate 94 and further supporting a guide strip 198. Guide strip 198 is constructed so as to provide a substantially greater amount of clearance between guide strip 198 and web guide 100 than is provided between guide strip 98 and web guide plate 100. Accordingly,

1 separated just prior to severing of an article so that further alignment
2 can occur via coaction of the die surface and/or an alignment structure
3 which further laterally positions articles relative to associated punches
4 and dies of the trim press.

5 As shown in Figure 2, knock mechanism 110 comprises a kinematic
6 linkage having a center pivot point and a lever arm at one end that
7 contacts stationary platen 28 as treadle 10 is moved there against during
8 a severing operation. The other end of mechanism 110 carries follower
9 wheel 70. Such contact rotates follower wheel 70 away from drive wheel
10 72 so as to open up a gap therebetween, thereby releasing respective
11 edges of the web to ensure further centering. Further centering relies
12 on contour features of the individual punches 22 coacting in combination
13 with the shape of in-molded articles in the web to laterally further align
14 such articles relative to each respective punch and die, according to one
15 construction.

16 Figure 3 illustrates in simplified form the arrangement of punch
17 plate 30, web guide plate 100 (configured here as a stripper plate), and
18 die plate 32. Controller 18 includes control circuitry 68 which is
19 operative to control the servo motors which activate drive wheels 72.
20 Follower wheels 70 are retractable in response to actuation of knock
21 mechanism 110, illustrated in Figure 2.

22 As shown in Figure 3, guide strip 98 serves principally to guide
23 web 16 and articles 14 against plate 100. In contrast, guide strip 198

is spaced a significant distance away from plate 100, and principally serves to support detector 106. However, guide strip 198 also serves to grossly retain web 14 into position along plate 100 in the event that web 16 becomes suddenly significantly misaligned. Accordingly, under normal operating conditions, guide strip 198 serves as the only principal guide for retaining web 16 in close proximity against web guide plate 100. Accordingly, frictional forces therebetween are significantly reduced. Furthermore, emitter 104 and detector 106 further serve to detect the location and positioning of articles 16 as they are delivered via drive wheel 72 (and associated servo motor). All such control is choreographed utilizing controller 18 as well as a feedback signal from detector 106.

As shown in Figure 3, punch plate 30 includes a plurality of punches 22, each supported on axially guided springs. The springs facilitate interdigitation and lateral alignment with appropriately configured articles 14, and compress and coact with punch plate 30 during final severing against die plate 32 through the holes within plate 100.

As shown in Figure 3, follower wheels 70 are caused to open (or retract) away from drive wheel 72 via action of knock lever mechanisms 110 (see Fig. 2). Such retraction further facilitates lateral alignment of web 16 and articles 14 relative to punches 22 and dies within die plate 32.

Also illustrated in Figure 3, guide strip 98 is shown in close proximity with web guide plate, or web guide member, 100. In contrast, guide strip 198 is shown spaced relatively far apart from plate 100.

Figure 4 illustrates an enlarged partial view corresponding with line 3-3 of Figure 2, the relative positioning of guide strip 98 of primary guide member 82 (see Fig. 2) relative to web guide plate 100. Guide strip 98 is provided in relatively close proximity with plate 100 so as to ensure alignment and positioning of web 16 (and articles 14) relative to articles apertures 102 in plate 100.

In compliance with the statute, the invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific features shown and described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims appropriately interpreted in accordance with the doctrine of equivalents.

1 CLAIMS:

2 1. A trim press article handling apparatus, comprising:
3 a frame;
4 a punch carried by the frame;
5 a die carried by the frame and cooperating in relative
6 movement with the punch to sever articles from a web; and

7 a treadle carried for movement relative to the die, the
8 treadle including a web guide member, a primary guide strip spaced from
9 the guide member slightly greater than a thickness of the web, a
10 secondary guide strip spaced from the guide member at least four
11 thicknesses of the web and spaced apart from the primary guide strip,
12 and an article detector carried by at least one of the primary guide strip
13 and the secondary guide strip and operative to detect position of an
14 article in the web by detecting the position of a protuberance in the
15 web as the protuberance is conveyed between the primary guide strip and
16 the secondary guide strip.

17
18 2. The article handling apparatus of claim 1 further comprising
19 control circuitry communicating with the article detector and a drive
20 motor operative to move the treadle, the control circuitry configured to
21 receive an input signal from the article detector indicative of the position
22 of a web-supported article relative to the punch and the die, and
23 operative to control operation of the drive motor to synchronize

1 movement of the web-supported article via controlled motion of the
2 treadle.

3
4 3. The article handling apparatus of claim 2 wherein the article
5 detector comprises an optical emitter and a photodetector, one of the
6 optical emitter and the photodetector provided on the primary guide strip
7 and the other provided on the secondary guide strip spaced apart from
8 the primary guide strip, wherein movement of a protuberance in the web
9 between the optical emitter and the photodetector generates an output
10 signal from the photodetector to the control circuitry indicative of the
11 location of an article relative to the guide plate member.

12
13 4. The article handling apparatus of claim 2 wherein the article
14 detector comprises an optical detector configured to generate a signal
15 indicative of a change of state when a protuberance is detected with the
16 optical detector.

17
18 5. The article handling apparatus of claim 2 wherein the
19 protuberance is an article formed in web.

20
21 6. The article handling apparatus of claim 2 further comprising
22 a drive wheel assembly for moving a web and articles, the drive wheel
23

1 assembly comprising a pair of roller feed assemblies provided on opposed
2 edges of a web.

3
4 7. The article handling apparatus of claim 6 wherein each of
5 the pair of roller feed assemblies provides a servo pick assembly having
6 a servo motor controllably driven by the control circuitry.

7
8 8. The article handling apparatus of claim 1 wherein the
9 primary guide strip and the web guide member depend in a vertical
10 orientation from the treadle and the punch and the die are supported
11 for relative movement in a horizontal direction.

12
13 9. The article handling apparatus of claim 7 wherein a topmost
14 portion of the primary guide strip is flared away from the web guide
15 member to accommodate entrance feeding of the web during movement
16 between the treadle and the frame.

17
18 10. The article handling apparatus of claim 1 wherein the web
19 guide member comprises a web guide plate providing a stripper plate for
20 a trim press.

21
22 11. An article conveying, guiding, and locating device, comprising:
23

1 a treadle including a web guide plate, a guide strip spaced
2 slightly greater than a thickness of the web from the guide plate;

3 a web conveyor having a servo pick assembly and a servo
4 helper assembly driven by a servo motor, and configured to move a web
5 of articles wherein the servo pick assembly is carried by the treadle;

6 an article detector carried by the treadle and operative to
7 detect location of an article in the web during movement of the web;
8 and

9 a controller communicating with the drive motors and the
10 article detector and operative to controllably regulate and synchronize
11 operation of the servo pick assembly and the servo helper assembly in
12 response to detected location of the article.

13
14 12. The device of claim 11 wherein the motor for the servo pick
15 assembly comprises a servo motor carried by the treadle.

16
17 13. The device of claim 11 wherein the article detector detects
18 location of an article in the web by optically detecting the location of
19 a protuberance in the web provided at a known location in the web
20 relative to an article.

21
22 14. The device of claim 11 wherein the web conveyor comprises
23 a pair of wheels provided along each edge of the web.

15. The device of claim 14 wherein each pair of the wheels comprises a drive wheel and a follower wheel coacting on opposite sides of the web, wherein the drive wheel is driven by a servo motor under control of the controller.

16. The device of claim 11 wherein one of the drive wheel and the follower wheel is selectively engaged and disengaged under control of the controller such that each pair of drive wheel and follower wheel is disengaged in anticipation of a severing operation to remove the articles from the web.

17. The device of claim 11 wherein the guide strip is spaced from the guide plate less than four thicknesses of the web.

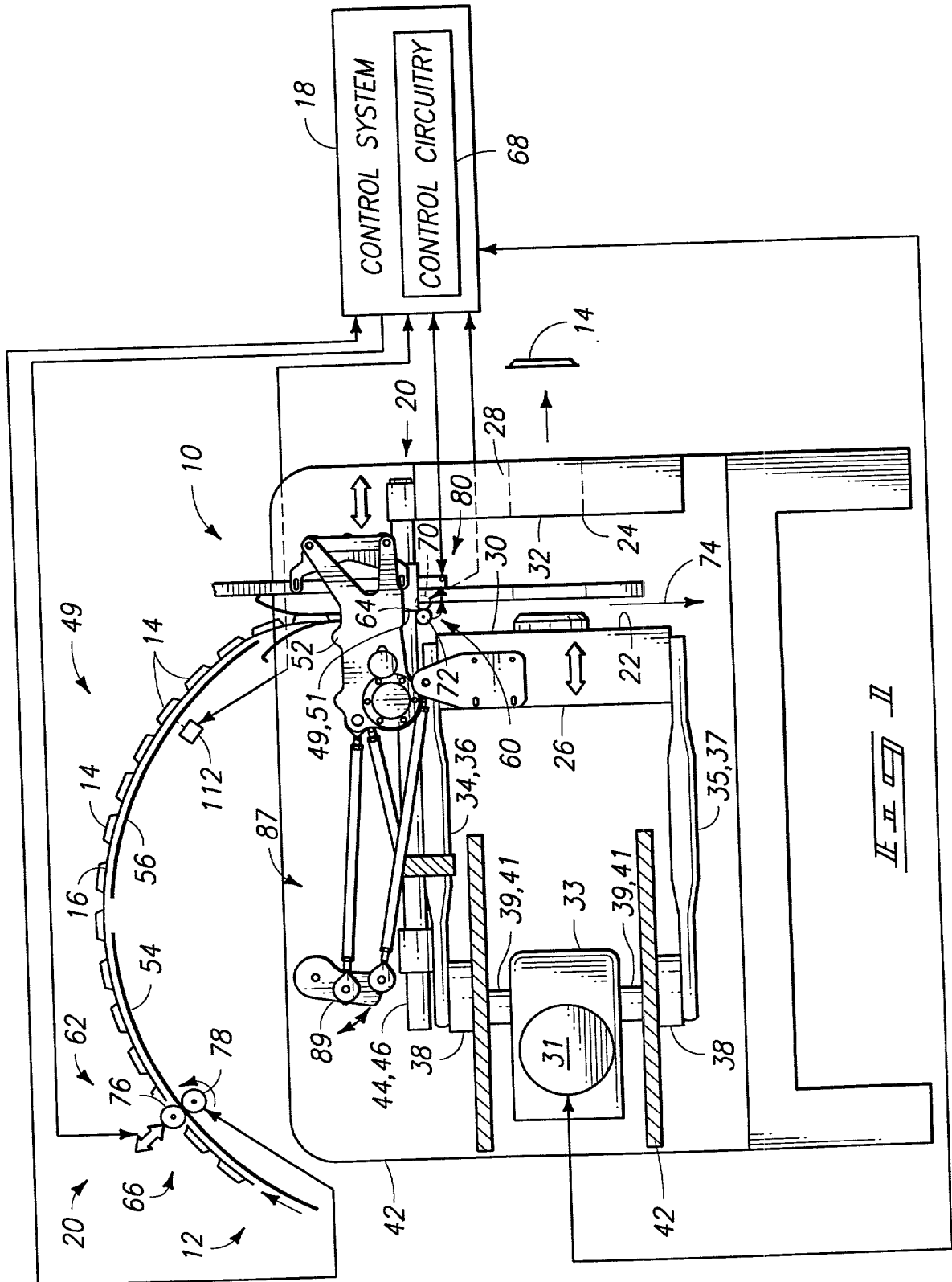
18. The device of claim 11 further comprising a canopy, wherein the servo helper assembly is carried by the canopy and the servo pick assembly is carried by the treadle, and wherein a web detector is provided between the servo helper assembly and the servo pick assembly to detect proximity of the web relative to the canopy, and wherein the controller, in response to movement of web from the canopy, regulates operating speed of the motor for the servo helper assembly to adjust delivery speed at the servo helper assembly relative to delivery speed of the motor at the servo pick assembly.

ABSTRACT OF THE DISCLOSURE

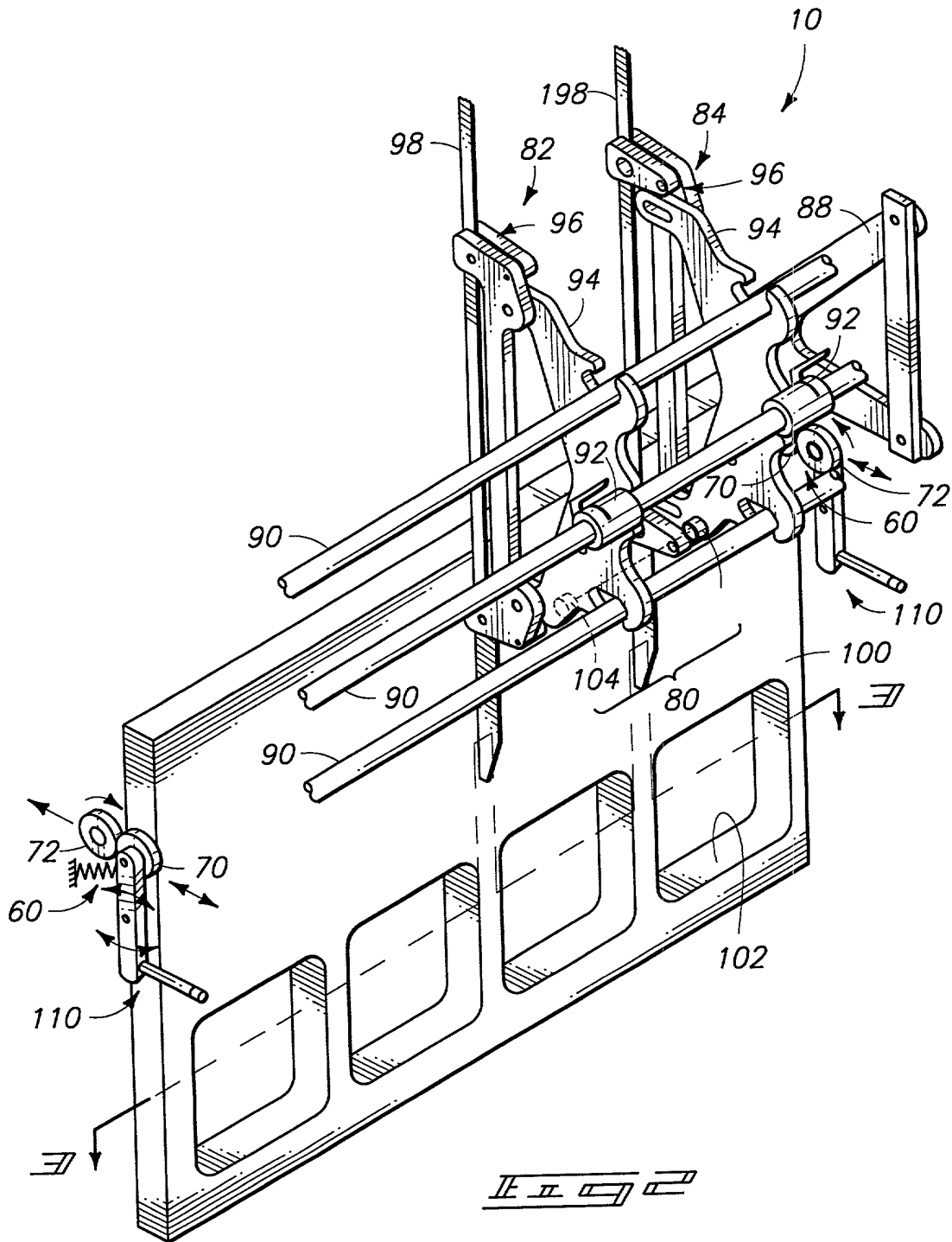
A trim press article handling apparatus includes a frame, a punch, a die, and a treadle. The punch is carried by the frame. The die is carried by the frame and cooperates in relative movement with the punch to sever articles from a web. The treadle is carried for movement relative to the die. The treadle includes a web guide member, a primary guide strip spaced from the guide member slightly greater than a thickness of the web, a secondary guide strip spaced from the guide member at least four thicknesses of the web and spaced apart from the primary guide strip, and an article detector carried by at least one of the primary guide strip and the secondary guide strip. The article detector is operative to detect position of an article in the web by detecting the position of a protuberance in the web as the protuberance is conveyed between the primary guide strip and the secondary guide strip. A method is also provided.

1/4

000101" 47498960



2/4



000701" 47298960

3/4

